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No. 5

Surgeons General of the Past

(The nineteenth in a series of brief biographies)



William Clarence Braisted, the fifteenth Surgeon General of the Navy, was born in Toledo, Ohio, on 9 October 1864. After receiving his early education in Toledo, he entered the University of Michigan at Ann Arbor and was graduated with the degree of Bachelor of Pharmacy in 1883. He then studied Medicine at the College of Physicians and Surgeons, Columbia University, New York, N.Y., from which he was graduated, honor man in his class, in 1886. He interned at Bellevue Hospital, New York, and from 1888 to 1890 practiced Medicine in Detroit, Michigan. He was appointed an Assistant Surgeon in the Navy on 24 September 1890 and served at sea aboard the *Vesuvius*, Columbia, Ohio, Detroit, Topeka, Connecticut, Wyoming and Utah. His shore duty included various Naval hospitals and stations (Norfolk, Va.; New York, N.Y.; Newport, R.I., and others), and he was twice an instructor in Surgery at the Naval Medical School, Washington, D.C. In 1906 as Assistant to the Chief of the Bureau of Medicine and Surgery he had charge of reorganizing the Bureau. He was instrumental in the founding of the U.S. Naval Medical Bulletin, and for a year, during the absence of the Surgeon General, served as Attending Physician to President Theodore Roosevelt. He wrote an outstanding medical report on the Russo-Japanese War. In February 1914 he was appointed Surgeon General of the Navy, serving until 1920. As such he was responsible for the construction and administration of the most up-to-date hospitals, the establishment of special training schools for the Hospital Corps and the building of the hospital ship *Relief*. Admiral Braisted was retired from the Navy on 29 November 1920 and died 17 January 1941.

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GRANULOMATOUS DISEASES OF THE SMALL AND LARGE BOWEL— A HISTORICAL SURVEY

Burrill B. Crohn MD, New York, New York, *Gastroenterology* 52(5):767-772,
May 1967.

The Background

As a medical student at the College of Physicians and Surgeons (1907), I recall distinctly that our Professor of Medicine suggested to us that we skip the chapter on diseases of the small intestine in the *Osler Textbook of Medicine*, since only tuberculosis of the small bowel was recognized.

As pathological intern at Mount Sinai Hospital (1907-1908), it was my duty to assist at all autopsies; as a continuous member of the staff I had witnessed all or most of the autopsies performed for many years thereafter. Our chief, Dr. Emanuel Libman, always made a point of insisting that the small bowel be opened and examined, an admonition which was necessary since often it was the careless habit to ignore that small bowel as being of no interest. And yet, throughout those years, except for tuberculosis and a rare, occasional random granuloma, nothing of interest had ever been encountered. (Ileitis patients "never" die!)

One of the hoaxes of the early decades of this century was the diagnosis of "chronic appendicitis," a disease that never existed. Innumerable patients with vague abdominal distress, functional or otherwise, were explored and an innocent atrophied appendix was removed as the so-called guilty cause of the complaints. In 25 percent of our earlier series of ileitis, the patient had undergone a previous appendectomy for "chronic appendicitis." Had the surgeon been a bit more scientifically inquisitive and allowed his exploring fingers a further radius of a few inches, *he* and not a medical clinician would have found the ileitis.

In the Beginning

Case 1, seen in 1930, was a young man of 17 who was under hospital observation for fever,

diarrhea, abdominal pain, and a tender mass palpable in the right lower quadrant of his abdomen. Presumably this was "ileocecal tuberculosis." Exhaustive studies of the sputum, the gastric content, and the stools were all negative for tubercle bacilli. But here now was a new generation standing on the shoulders of our predecessors, and new scientific methods had been devised. The von Pirquet test, intracutaneous, and the Calmette test, conjunctival, for tuberculosis were, in this instance, negative. Only in these recent years had we at our disposal X-ray films of the chest; the radiographs of the chest in this patient were negative.

Since we had at hand no specific means of treating an intraabdominal infection, and since oxygen gas insufflation into the peritoneal cavity had failed to alter the course of the disease, my appeal was made to Dr. A. A. Berg, the senior surgeon, for an exploratory laparotomy. Dr. Berg declined; he explained that at the urgent request of Dr. E. L. Trudeau of the Trudeau Sanitarium in the Adirondacks, he had been unwillingly persuaded to operate upon five patients with ileocecal tuberculosis. The results were so disastrous that he would contemplate no such further rash procedure. But since all the modern tests for tuberculosis were negative in this patient, Dr. Berg relented and we were enabled to see and to examine for the first time a specimen of typical granulomatous terminal ileitis. In the laboratory, with the guidance of Dr. Paul Klemperer, every test of the specimen for tuberculosis was negative, including every type of culture, and animal inoculations into guinea pigs and other supposedly susceptible animals.

Within 2 years, Dr. Berg and I were able to gather 13 more cases of identical nature which constituted the basis for the first publication. This was partly because lying in the wards of the hospital were several patients with chronic abdominal disease with intestinal fistulae opening on the ab-

This article was prepared in response to a request from the Editor of *Gastroenterology* to commemorate the 35th anniversary of the first clinical description of this disease.

dominal wall. Most of these had undergone a previous futile operation for "chronic appendicitis" and it was always in the scar of previous surgery that the abdominal fistula was noted. Having learned that internal and external abdominal and intestinal fistulae were a characteristic of the new disease, it was a fair presumption that perhaps these undetermined diseases were, after all, granulomatous in nature. Jocularly, we would call them tuberculosis without tubercle bacilli and actinomycosis without actinomyces. I recall one much-operated patient with 11 abdominal wall fistulae. These fistulous patients, on operation, were included in our earliest and first series. The 14 resected specimens all showed the characteristic findings of typical granulomas with round cell infiltration, fibroblasts, plasma cells, pseudomiliary tubercle formation, often with giant cell inclusions.

Pathologists had long been familiar with the gross and microscopic features of intestinal granulomas. As early as 1920 Tietze had already collected 281 references from the world literature on this subject. In our own laboratories E. Moschcowitz and A. O. Wilensky had studied and published on nonspecific granulomas of the intestine (1923) and Drs. Leon Ginzburg and Gordon D. Oppenheimer were engaged at that very time in a similar study of resected surgical specimens in our laboratories. All of these theses in the literature were devoted to the pathology of granulomas; the clinical aspects of these diverse findings had apparently been omitted and certainly not classified or collected as a disease entity.

The First Publication

With 14 proven cases of an apparently new clinical entity, with pertinent clinical characteristics, operative findings, and gross and microscopic studies, it was time to consider publication. Dr. Berg, with unnecessary modesty, declined or preferred not to act as coauthor, but suggested generously that the two younger men, Ginzburg and Oppenheimer, who were then engaged in the study of intestinal granulomas, act as coauthors. The paper was written jointly and was read by me at the annual meeting of the American Medical Association in New Orleans in 1932, "Regional Ileitis, a Pathological and Clinical Entity." In looking over my original transcript I note that the original title was "Terminal Ileitis," for in all the first patients the disease was limited to the terminal ileum. During the discussion of the paper at the

meeting, Dr. J. Arnold Barger of the Mayo Clinic, who was sitting next to me, suggested that perhaps in the near future further and higher segments of the small bowel might be found to be involved, and he suggested that the term "regional" would be a better appellation than "terminal." The title was promptly changed to "Regional Ileitis" rather than "Terminal Ileitis."

The paper was widely accepted and discussed and stands today accurate in its captions and details, with one exception. We, or I, distinctly noted that in contrast to ulcerative colitis no perirectal fistulae or abscesses occurred; this was soon corrected. The X-ray findings in the original paper were very insufficient and represented only the obstructive phases. We were soon to learn from John L. Kantor (1934) the typical radiographic appearance which he termed "like a string-sign," which term has remained in current practice.

The Extension of "Terminal Ileitis" to Wider Fields

What was conceived and born in the terminal segment of ileum soon had wider anatomical and clinical recognition. Already in 1933 Harris, Bell, and Brunn led to the identification of ileojejunitis either as extensive involvement throughout the small bowel or as a continuation upward of terminal ileitis.

The participation of the colon segmentally or by contiguity from the terminal ileum was first noted by Colp (1934) and again by Crohn and Rosenak (1936). Involvement of the duodenum was first noted in 1937; the first patient seen with granulomatous disease of the stomach came later, in 1949.

Acute regional ileitis was included in the original paper in 1932. As late as 1949 I was still denying that perforation of ileum in acute ileitis had occurred in my experience. With more time and many more patients the recognition of perforation in acute ileitis was conceded as not infrequent. The newer light illustrates the purely suppurative nature of the acute phase of the disease before granulomatous proliferation has had time to reinforce the resistance of the bowel and explains why perforation in the acute phase can and does occur. It may well be that, since it was later demonstrated that ileitis is three times more common in Jews than in the control population, our clinical material at Mount Sinai afforded us a greater opportunity for studying the disease.

Surgical Treatment of Chronic Regional Ileitis

In the original series only resection was practiced, which of course allowed for the study of the pathology of the disease. In the interests of safety, the surgical procedure was a two-stage operation. The first stage consisted of short-circuiting (ileo-transverse colostomy) with transection of the ileum; the second stage 3 weeks later, resection of the original site of disease in the terminal ileum. It was soon learned that the residual segment of terminal ileitis had in the 3-week interval undergone almost complete healing. The second stage of the operation was therefore considered unnecessary. Medical treatment was solely expectant—the only intestinal antibiotics were in the group of sulfonamide drugs and they were of no evident benefit.

Segmental (Granulomatous) Colitis

In 1938 Crohn and Berg described as a syndrome "right-sided regional colitis," implying that here was a form of colitis, ulcerative colitis, differing from the conventional rectosigmoid type in its anatomical distribution and in the exemption of the rectosigmoid from inclusion in the process. The alert J. A. Bargen and H. M. Weber of the Mayo Clinic had already noted in 1930 a type which they captioned "regional migratory ulcerative colitis." Little attention was paid to their publication; both they and I considered this segmental form of colitis to be ulcerative rather than granulomatous. The incidence of the disease was numerically infrequent; the pathologists at Mount Sinai regularly reported the resected specimens as ulcerative and not as granulomatous, surely not because of lack of familiarity with granulomatous disease! And this, too, despite involvement of the terminal ileum in a large percentage of patients.

In 1952 Wells in Great Britain for the first time described "segmental" colitis as granulomatous rather than as an ulcerative disease. Two years later Newman and Dockerty (1954) in this country reported 25 patients with segmental colitis as having granulomatous disease. Most recent British authors have since referred to segmental colitis as "Crohn's disease of the colon." When I mildly protested, they insisted that this usage was to reinforce in the minds of their students the granulomatous nature of the disease. The pathologists were still reporting at least half the resected specimens

as ulcerative in nature and not typically granulomatous; I feel sure that they were correct, and this view was corroborated in a recent paper by Marshak, Lindner, and Janowitz.

However, because of specific differences in clinical features and clinical course and in the interests of uniformity of nomenclature, the disease is now rather generally accepted as segmental granulomatous disease of the colon, usually without rectal involvement in the disease process.

The medical treatment of granulomatous colitis is similar to that of regional ileitis—the corticosteroids allay inflammation and quiet active symptoms. The exact role of the corticosteroids is not well understood, but their value in allaying symptoms, fever, pain, and diarrhea is clinically readily apparent. No "cure" in the sense of pathological reversal is claimed, although in some of the cases of segmental colitis the apparent permanent relief from symptoms is very encouraging. Occasionally, too, the radiographic study may show a complete disappearance of the previously evident pathological process.

Antibiotics are useless except for suppurative complications. The diet may be generous, except for roughage, coarse vegetables, and fruit. Salt is generally restricted during steroid therapy.

Surgical resection is indicated where medical treatment is a failure and where a resection of a limited segment of proximal colon (and probably terminal ileum) is feasible. Unfortunately, in approximately 50 percent of the patients, the rectum becomes subsequently the seat of a granulomatous or ulcerative extension, in which instances permanent ileostomy is the only lifesaving procedure.

Remarks

As to the etiology of these (or this) diseases, no causative agent, bacterial or viral, has been incriminated. The actual etiology is completely unknown.

The question arises, "Are these granulomatous diseases one or are they two distinct entities?" Obviously with so many clinical manifestations in common—fever, fistula formation, systemic effects, and often familial distribution—they closely resemble each other. In trying to form a hypothesis I like to think of them as forms of reaction to a single or a variegated "virus" (an unknown etiological agent) in which the reaction varies in the different segments of the lower gastrointestinal tract. The terminal ileum is the most common seat of the

"infection"—here the lymphoid tissue is most prolific at the same time that the intestinal wall seems most porous. The reaction of the intestine to the "virus" is, by vast proliferation of granulation tissue, to attempt to localize the infection and to prevent its spread. The failure to localize the inflammation results in leakage and fistula formation, internal and external. The adjacent cecum and ascending colon participate in the process in many of the cases (combined ileocolitis), and here the process in the colon is again granulomatous. The intestinal tract proximal to and distal from the critical ileocecal region loses gradually its tendency both to granulomatous change and to fistula formation. The upper jejunum, duodenum, and stomach are rarely involved, as is also true for the distal sigmoid and rectum.

After resection for ileitis the recurrence is always in the new distal ileum (not in the colon); recurrences after resection for granulomatous colitis are always in the distal colon.

In ulcerative colitis the pathological process is ulcerative and suppurative. The bowel wall is eroded, and the distended toxic dilation tends to spontaneous perforation. Even when the inflammatory process in ulcerative colitis passes the ileocecal valve barrier and involves the ileum, the process remains ulcerative and never granulomatous. On the other hand, in cases of ileitis with fistula from terminal ileum to sigmoid, the sigmoid usually becomes involved in a granulomatous inflammatory process.

In patients with long-standing ulcerative colitis, carcinoma occurs in approximately 7 percent; in granulomatous colitis carcinoma occurred only twice in our series of 261 patients.

What is the ultimate prognosis in these two forms of granulomatous disease? I have often remarked that the mortality rate of regional ileitis is practically nil—four of 1,100 patients. Medical treatment was satisfactory in only 120 of these over a long period of time—some alleviation of symptoms can be achieved, the patient can be maintained in relative comfort, with pain and diarrhea controlled in the absence of external fistulae. The large remainder, almost 90 percent, undergo surgical interference, and the operative procedure should be accompanied by no surgical risk. The 30 percent (or 40 or 50 percent) of recurrences are truly disappointing, and yet not altogether dis-

couraging. Because, for one, the recurrences in the "new" terminal ileum are usually milder than the original disease in the natural terminal ileum; and the recurrences may occur late, very late in the life history of the disease—5, 11, 19, even 25 years after the original operation.

The prognosis in granulomatous colitis is better than that of ileitis. Of the segmental cases, 30 to 50 percent can be maintained in comfort and with control of symptoms on corticosteroid therapy.

The "universal" type of ileocolitis with involvement of the entire colon to the rectosigmoid angle is a more severe form; even so, after extensive resection with ileosigmoidostomy approximately 50 percent of the patients are well. These figures are based upon my recent follow-up (though incomplete) of 261 patients with right-sided or segmental disease, granulomatous or ulcerative.

Ulcerative colitis (3,200 cases in my files) is a much more severe disease, more "toxic," with fever, debility, anemia, pain, and bloody diarrhea. The probability of complete lifetime cure is remote. Fortunately radical colectomy and permanent ileostomy is lifesaving. As I recall in the distant past, emergency ileostomy alone was attended by high, very high, mortality, up to 40 percent—now even the more radical resection (subtotal or total colectomy) is a safe and a curative procedure.

I think back to my intern days at Mount Sinai (1907–1910) when with wonderment a case of ulcerative colitis was first seen and studied on the wards and proved by the recently devised electrically illuminated sigmoidoscope, before even barium enema had been perfected. Is this vast array of ulcerative and granulomatous diseases of large and small bowel a new phenomenon—are they "new" diseases or were they just overlooked in former years? It is almost impossible to conceive that Morgagni and the exquisitely accurate French and German pathologists could have overlooked such grossly evident diseases. Are these new diseases the product of our modern civilization in the nature of psychosomatic diseases, the end product of the Industrial Revolution? The answer is not evident; it is, however, most disappointing to realize that intensive psychotherapy does not give hope of even moderate alleviation, not to mention cure.

(The omitted references may be seen in the original article.)

CONSERVATIVE TREATMENT AND NATURAL HISTORY OF ACUTE LUMBAR DISC LESIONS

John Pearce and J.M.H. Moll, (From the Neurological Departments of The General Infirmary at Leeds and Pinderfields General Hospital, Wakefield) J Neurol Neurosurg Psychiat 30(1):13-17, February 1967.

Lesions of the intervertebral discs are the commonest identifiable cause of acute back pain and sciatica. Chronic degenerative lesions of the intervertebral discs, and of the intervertebral facets and ligaments, may be responsible for some examples of long-standing backache. So common, however, are psychoneurotic features, compensation claims, and other motivating factors in the presence of minor radiological changes, which often do not correlate with the clinical features, that the evaluation of chronic backache is extremely difficult.

Despite the fact that the acute lumbar disc lesion is extremely common, its natural history has never been adequately studied. Numerous studies of the pathological and anatomical basis of the syndrome have been reported (Saunders and Inman, 1940; Bradford and Spurling, 1947; Friberg and Hirsch, 1950), and there are many accounts of the role of surgical treatment, including those of Spurling and Grantham (1949), O'Connell (1950), and Decker and Shapiro (1957). However, it is remarkable that the literature contains few papers reporting the results of conservative treatment, and the evaluation of some of the many forms of therapy which are commonly used.

Conservative treatment includes such non-operative measures as spinal traction, manipulation, plaster of Paris spinal jackets and Goldthwait lumbar supports, and strict rest in bed alone.

Of these measures there is no doubt that absolute rest in bed is the simplest, requiring no apparatus, and is also the safest, avoiding the cord damage, often irreversible, which is known to occur occasionally as a sequel to spinal traction or manipulation. It is not the purpose of this paper to assess forms of treatment other than simple rest in bed, since no relevant scientific data are available. If clinical experience is of any value it is the opinion of many authorities that spinal manipulation, although producing unpredictable and occasionally

dramatic cures, is often of no benefit and can be frankly dangerous. Similarly, there is no real evidence that traction does any more than keep the patient still and at strict rest in bed. Since it is common experience that rest in bed is effective in some patients with acute disc lesions (Larson, 1957; Roseman, 1958; Jennett, 1964; Armstrong, 1965) it was decided to attempt an assessment of this procedure.

Materials and Methods

This study includes all patients admitted consecutively to the Neurological Unit of Pinderfields General Hospital within the last 13 years with a diagnosis of acute lumbar disc lesions. Patients were excluded on account of chronic back pain of uncertain nature, and patients in whom a strong neurotic element obscured the organic findings or made objective assessment impossible. Patients were also excluded for submission to early surgery on account of intractable pain after one to two months of absolute rest in bed; evidence of compression of the cauda equina with sphincter involvement (Jennett, 1956); and, diagnostic doubt if clinical or myelographic evidence left the suspicion of a spinal tumor.

Ninety-one patients were included, in all of whom the diagnosis had been made by a consultant neurologist (Dr. Hugh Garland), and at follow-up no case of spinal or pelvic tumour (which can on occasion mimic a disc lesion) was found. Thirty-eight patients were suffering from a first episode, and 53 suffered a recurrence, having had one or more acute episodes in the past. In all patients, however, the present episode was of abrupt onset occurring at a time the patient could clearly define. Restricted spinal flexion and straight leg raising were present initially, and signs of root compression were evident in many patients.

The method of treatment employed was the same for all patients. They were admitted to hospital and after the initial examination and investigations were completed they were confined to bed for 24 hours per day for two weeks. The mattress was placed on wooden fracture boards and only one pillow was permitted. If difficulty was experienced with bedpans the patient was assisted to use a bedside commode, but this was the only time he was allowed out of bed. After two weeks, if free of pain, the patient was gradually mobilized during the next week. If pain or restriction of straight leg raising persisted, absolute rest in bed was instituted for a further seven to 14 days. When walking in the hospital was possible without pain the patient was discharged and advised to return to work within the next few weeks at his general practitioner's discretion. Patients were told not to bend with the knees extended or to lift heavy objects for three months.

Fifty-three patients were interviewed and examined on average eight years (range 0-13) after the acute episode: these are designated group A. Despite repeated attempts 38 patients would not or could not be reexamined, but answers to a carefully worded questionnaire (see Appendix) were obtained from 20 patients who constitute group B.

It was decided to analyze the results of the groups independently, but if they shared a high degree of similarity the results would be finally assessed together. Despite the limitations of an inquiry by questionnaire, the questions are very simple and give only the objective facts concerning the occurrence of subsequent pain and disability. This is considered worthy of record and preferable to discarding *in toto* the results in this group,

which would itself prejudice the assessment of the results.

Results

Separate analyses of group A (assessed at interview and examination) and group B are considered. Sixty-eight patients (group A 48, group B 20) were studied. The results are presented in Tables I-VI. Five patients were subjected to surgery after their first admission and are excluded from the analysis of conservative treatment, but as failures of such are considered further in the discussion.

Severity of Chronic Symptoms. These observations were recorded as absent, mild, moderate, or severe. The degree of severity of pain was based on the patient's assessment.

It can be seen from Table I that 26.5 percent of the patients at the time of follow-up interview were found to be completely free from pain, 41 percent were still troubled by mild pain, while 32.4 percent were having moderate or severe pain.

TABLE I
SEVERITY OF PERSISTING PAIN

Degree	Absent	Mild	Moderate or Severe
Group A (total 48)	11 (23%)	22 (45%)	15 (23%)
Group B (total 20)	7 (35%)	6 (30%)	7 (35%)
Groups A and B combined (total 68)	18 (26.5%)	28 (41.1%)	22 (32.4%)

TABLE II
SEVERITY OF RECURRENCE IN ACUTE EXACERBATIONS

Severity of Recurrence	Nil	Mild	Moderate	Severe	Moderate and severe combined
<i>Work Loss</i> (weeks/year)	0	4	4-8	8	
Group A (total 48)	28 (58%)	11 (23%)	4 (8%)	5 (11%)	9 (19%)
Group B (total 20)	11 (55%)	2 (10%)	3 (15%)	4 (20%)	7 (35%)
Groups A and B combined (total 68)	39 (57%)	13 (19%)	7 (10%)	9 (14%)	16 (24%)

Severity of Recurrence in Acute Exacerbations. Observations were made of the recurrence of pain necessitating a period of rest in bed or loss of work. It was decided to use the number of weeks lost from work per year as an index of severity. Accordingly, the following arbitrary scheme was used:—Nil, no work loss; mild, less than four weeks/year work loss; moderate, four to eight weeks/year work loss; severe, more than eight weeks/year work loss.

The recurrence rate is presented in Table II. There was no recurrence in 57 percent of patients, the recurrence was mild in 19 percent and moderate or severe in 24 percent of patients.

Physical Signs. These results were obtained (group A only) by comparing the physical findings at the time of follow-up with those recorded immediately before the period of strict rest in bed. The results were grouped as regression, no change, or progression. Observations included limitation of spinal flexion and straight leg raising, motor or sensory dysfunction, tendon reflex change, and muscle wasting. Table III shows that 60 percent of the patients were found to have some degree of improvement, 21 percent were unchanged, and 19 percent showed progression of the physical signs.

Working Capacity. The effect of persisting symptoms on working capacity was recorded simply as unchanged or diminished (Table IV). At the time of interview 71 percent of patients were still doing the same job. The remaining 29 percent, because of their residual symptoms, had taken up lighter work, which in most cases involved some loss of earnings.

Further Treatment. This excluded additional rest in bed between the initial hospital admission and the follow-up. Further conservative treatment included various forms of spinal support (usually a Goldthwait belt or a plaster jacket), traction manipulation, and physiotherapy. Reference to Table V shows that 49 percent had had no further treatment, 44 percent had required one or more types of medical treatment, while the remaining 7 percent had undergone surgery. In general, the 44 percent who had further medical treatment obtained no more relief than they had had by means

TABLE IV
WORKING CAPACITY

	<i>Unchanged</i>	<i>Diminished</i>
Group A (total 48)	35 (73%)	13 (27%)
Group B (total 20)	13 (65%)	7 (35%)
Groups A and B combined (total 68)	48 (71%)	20 (29%)

of rest alone. Occasional lasting relief was claimed by patients for manipulation or a plaster jacket, but conversely these measures were unsuccessful in many other patients.

Discussion

Assessment of the results of conservative treatment in lumbar disc lesions is complicated by the variable and episodic nature of the pain which characterizes the syndrome.

To enable an approximate comparison between the results of our own series and those conducted previously, the results from Table I (degree of persisting chronic symptoms) have been taken as representative. It is appreciated, however, that in previous studies residual symptoms have been analyzed together, there having been no clear separation between acute and chronic pain. A further difficulty arises with regard to the unavoidably arbitrary nature and minor differences in the classification of severity of symptoms. However, in most of the previously conducted series there can be recognized three broad divisions, namely, a pain-free group, those with mild symptoms, and a third category in which the degree of persisting symptoms has been regarded as an unsatisfactory response to conservative treatment.

The present study shows that 26.5 percent (Table I) of patients were symptom-free at the time of follow-up interview. In the majority of cases freedom from symptoms had exceeded one year. These results of subjective pain, and the working disability incurred by our patients, can be compared with those of previous workers. Kirsten (1945) studied a selected series of 49 patients of whom 24 were not subjected to operation. Only 12.5 percent of this group were totally symptom-free, but the follow-up period was short, ranging from six months to three years; moreover, the series was highly selected. Dunning (1946)

TABLE III
PHYSICAL SIGNS

	<i>Regressed</i>	<i>Same</i>	<i>Progressed</i>
Group A (total 48)	29 (60%)	10 (21%)	9 (19%)

TABLE V
FURTHER TREATMENT
Type of Treatment

	<i>Nil</i>	<i>Medical</i>	<i>Surgical</i>
Group A (total 53)	23 (44%)	25 (47%)	5 (9%)
Group B (total 20)	13 (65%)	7 (35%)	0 (0%)
Groups A and B combined (total 73)	36 (49%)	32 (44%)	5 (7%)

reported on 55 patients treated conservatively for sciatica attributed to lumbar disc lesions. Thirty-six percent of these patients were free of symptoms at a follow-up examination or in response to a questionnaire. Earlier Ekvall (1939) followed up 74 patients four to five years after the onset of sciatica. Twenty-three were entirely free of symptoms and a further 21 patients, although suffering from minor symptoms were capable of hard manual labour. In 1949 Colonna and Friedenberg reported on 29 patients treated conservatively of whom 29 percent were free of symptoms, 71 percent had residual pain, and 32 percent were dissatisfied, implying more severe pain. The authors, guided by these results, recommended surgery for patients with lumbar disc lesions not responding quickly to conservative treatment, but in their larger series of 95 operated patients 40 percent had residual symptoms and 13 percent were dissatisfied with the results of surgery. From these and other series referred to, it is clear that surgical treatment is not the entire answer, even in carefully selected patients, to the problem of acute lumbar disc lesions.

Patients still suffering from mild symptoms, usually unassociated with work loss, comprised the largest proportion of the present series, 41 percent. Comparison with previous studies reveals that 18 percent (Dunning) and 39 percent (Colonna and Friedenberg) of patients had chronic but mild symptoms.

Our moderate and severe chronic pain categories have been combined and will arbitrarily represent the "unsatisfactory response" group referred to previously. In a large proportion of patients there had been loss of work or diminution of working capacity. Our figure, 32.4 percent, approximates closely to Colonna's result of 32 percent but less closely to that of Dunning, 46 percent. In Armstrong's view (1965), patients who fail to respond

to conservative treatment amount to between 10 percent and 20 percent of patients seen by a surgeon.

A more objective and useful method of assessment lies in the measurement of recurrence of acute pain severe enough to necessitate a period of rest in bed or loss of working time. The period of work loss has been used as a parameter of severity according to the scheme outlined previously. We are unable to compare these results with previous work since no similar estimates have been employed in the past. In our experience this is the most useful means of assessing the results of treatment.

It was found, by means of a separate analysis, that there exists a degree of correlation between the recurrence rate of acute exacerbations and the severity of chronic residual symptoms. In other words, patients who had enjoyed absolute freedom from further acute exacerbation tended also to be free, or relatively free, from chronic pain. Similarly, those patients who had been incapacitated by several acute exacerbations also carried with them a high incidence of severe chronic symptoms. The period elapsing between initial treatment and recurrence of acute pain appeared to follow no single pattern.

It has become popular belief at the present time that most patients treated conservatively recover completely. This view is not consistent with the results of the present survey. The over-all results which are shown in Table VI show a high degree of correlation between loss of work from acute symptoms, chronic symptoms, and the need to change occupation. Following conservative therapy 32.4 percent had serious chronic symptoms and 24 percent incurred serious loss of work because of acute pain. Twenty-nine percent had changed their occupation because of persisting symptoms. We regard these patients as a failure of treatment. The remainder (approximately 70 percent) were not seriously incapacitated after the period of conservative treatment, and in this group treatment is judged to have been successful.

The proportion of patients treated initially by conservative means and who eventually require surgery varies considerably according to the authority. Armstrong (1965) gives the figure for many orthopaedic surgeons as between 2 percent and 5 percent, although in his own opinion the percentage is much higher, namely between 10 percent and 20 percent. According to Brain (1962), the surgical referral rate is probably not more than

TABLE VI
OVERALL RESULTS ¹

<i>Chronic Symptoms</i>		<i>Acute Symptoms Measured by Work Loss</i>		<i>Change of Work</i>	
<i>Moderate or severe</i>	<i>Mild or Absent</i>	<i>Nil or Year</i>	<i>< 4 Weeks/ Year</i>	<i>Yes</i>	<i>No</i>
32.4%	67.6%	24%	76%	29%	71%

¹ Mean follow-up eight years (range 0–13 years)

10 percent. As shown previously (Table V), 7 percent of our own series eventually underwent late surgery, but in addition several patients required early surgery (for the indications already outlined).

There is no evidence to suggest that an acutely protruded lumbar disc ever regains its normal position. It is probable that the relief of pain is due to a subsidence of root sleeve oedema, inflammatory changes, and fibrosis and ankylosis around the protruded disc substance. It is not clear precisely what role, if any, rest in bed has on the long-term healing process, but the prevention of spinal movements is of importance in the relief of the acutely painful symptoms. In about 70 percent of patients this treatment is satisfactory, and is preferable to other conservative measures by virtue of its simplicity and the almost total absence of complications. In the remaining 30 percent rest in bed proved to be of limited value. Since these patients did not obtain any consistent degree of relief from the other medical measures to which they were subjected it is tempting to suggest that they all required surgical intervention. However, as pointed out in the introduction, patients with lumbar disc lesions are very prone to a psychogenic exaggeration of their primary organic symptoms, and if the basis for the latter is a minor structural change not reversible by an operation then it is likely that their symptoms will be aggravated by such a procedure. Such patients are frequently encountered.

With this reservation we feel that patients not responding to a period of adequate and absolute rest in bed, especially with the persistence of limited straight leg raising or scoliosis, should be subjected to early surgery. Since our patients were unselected it is probable that about 10 percent to 20 percent of patients suffering an acute lumbar disc will require surgical treatment.

Summary

An unselected group of 73 patients suffering an acute lumbar disc lesion has been studied and followed up after conservative treatment, for an average of eight years (range 0 to 13 years). In terms of persistence of pain, acute relapses, and working capacity, approximately 70 percent showed a satisfactory response and about 30 percent of patients showed a poor response to an initial period of absolute rest in bed.

It is suggested that many of the patients failing to respond to adequate rest in bed should be subjected to surgery providing that gross psychogenic symptoms are not a complicating factor.

We are grateful to Dr. Hugh Garland for permission and encouragement to study the patients. We thank Miss J. Berry and Miss P. Stollard for secretarial aid, and Dr. S. E. L. Borissow for helpful suggestions pertaining to this study.

Appendix

Questionnaire Sent to Patients in Group B

Please carefully fill in the answers to the following questions, to help us assess the results of your treatment. Tick the appropriate answers.

1. Have you had further pain in the back, buttocks or legs since treatment. YES. . . . or NO. . . . If the answer is YES fill in the following questions.

2. Has the pain been MILD. . . . MODERATE. . . . or SEVERE. . . .

3. Has the pain caused loss of time from work. YES. . . . or NO. . . . If so for how many weeks per year on average, Less than 4 weeks. . . . 4 to 8 weeks. . . . More than 8 weeks. . . .

4. Have you had further treatment since being discharged from this hospital. YES. . . . or NO. . . .

5. If YES to Question 4, did you have:—

Spinal support (corset). . . . A period of rest in bed. . . . Traction. . . . Operation. . . . Manipulation. . . .

6. Are you doing the same work or a similar type of work as you were doing before you developed your symptoms YES. . . . or NO. . . .

7. Are your present wages the same. . . ., more, or less. . . . than before. If less, how much less do you now earn each week. . . . Your own comments or observations:—

SLOW ARTERIAL LEAK CONSEQUENT TO UNRECOGNIZED ARTERIAL LACERATION

REPORT OF FIVE CASES

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Slow arterial leak may remain unrecognized and lead to loss of the affected extremity. This condition may not be recognized because it suggests traumatic aneurysm yet may have none of the signs of aneurysm. When physical examination fails to reveal the pulsation or bruit characteristic of aneurysm, the possibility that arterial damage has occurred may be discarded and the further investigation that would demonstrate the damage is not carried out, with catastrophic outcome.

Five cases are presented which were observed between the years 1942 and 1965. The arterial leaks were produced by perforation of the femoral artery by a Steinmann pin, a gunshot wound through the popliteal fossa, a femoral arteriogram, multiple injuries with open fracture of the femur, and multiple injuries from mortar blast, including injury to the thigh.

There was nothing unusual in the causative trauma in these cases except the proximity of the injury to a peripheral vessel. All of the slow leaks were from the femoral artery.

Case 1. A sixty-four-year-old male alcoholic sustained an intertrochanteric fracture of the left hip in September 1942. Skeletal traction through the femur was applied on admission. The next morning, when the site of the Steinmann pin at the level of Hunter's canal was seen by the attending surgeon, the pin was removed and traction was applied through the proximal end of the tibia. The fracture was considered to be healed after four months, but the patient continued to have a low-grade fever and his thigh remained swollen. Knee motion was slow in returning; and, five months after injury, when the footrest of his wheel chair inadvertently came undone, his stiff knee was acutely flexed.

After this episode, increased swelling of the thigh was noted and his temperature rose to 104 degrees Fahrenheit. Surgical exploration for what was believed to be an abscess led to evacuation of blood clots of various ages followed by brisk hemorrhage from the femoral artery which had been perforated by the Steinmann pin five months earlier. The extremity had to be amputated.

Case 2. A nineteen-year-old man shot himself accidentally in the left thigh with a .22-caliber pistol in June 1946. The wound of entry was in the area of Hunter's canal; the missile lodged between the head of the fibula and tibia. Circulation and nerve function of the limb appeared normal and the patient was not in shock. Two days later, it was noted that the circumference of the affected thigh was an inch larger than that of the normal side, and full extension of the knee was impossible because of hematoma in the popliteal space. The pulses of the dorsalis pedis and the posterior tibial arteries were palpable. The leg felt slightly warmer than the other side. Because of a febrile course, treatment with antibiotics was instituted and the patient became afebrile within five days. Four weeks after the injury, during physical therapy, the patient went into shock; the leg became paralyzed; and there was obvious arterial occlusion. The circumference of the thigh increased by four inches. Immediate exploration with evacuation of successive blood clots revealed brisk hemorrhage from a lateral rent in the popliteal artery. The patient required 4,000 cubic centimeters of whole blood while the artery was sutured primarily. Normal circulation was restored and the pulse in the dorsalis pedis could be palpated the day after surgery. Sensation to the foot returned within two weeks, and function to the gastrocnemius returned at the same time. The drop-foot consequent to this

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vascular accident required over a year for recovery.

Case 3. A thirty-three-year-old man was admitted to the hospital in December 1956 for evaluation of intermittent claudication in both calves, first noted when he was twenty-seven years old. Increased disability had developed just prior to this admission. The peripheral pulses were absent distal to the femoral pulses which were normal. Femoral arteriograms revealed occlusion of both superficial femoral arteries; subsequent lumbar aortogram revealed a saddle thrombus occluding a small portion of the common iliac artery. Both procedures confirmed the diagnosis of severe arteriosclerosis obliterans. A right lumbar sympathectomy resulted in increased warmth of the right lower extremity but no change in the severity of claudication. The patient was transferred to a general hospital for vascular surgery where a lumbar aortogram and femoral arteriograms revealed the same vascular impairment. Within forty-eight hours after the femoral arteriogram, cellulitis developed in the right inguinal region and antibiotics were administered. The cellulitis slowly resolved, but the patient continued to have an intermittent fever despite the various combinations of antibiotics that he received. A soft, tender swelling developed in the left groin followed by petechiae and edema of the ankle of the left lower extremity. Pain became severe. Hydrocortisone was instilled into the left hip, with no relief of the hip and groin pain. At the time of transfer to the Orthopaedic Service, four months after the first arteriogram, the patient complained of pressure pains in the entire left lower extremity. The thigh was tender and one-half again as large as the normal thigh, and the leg was swollen down to the toes. Pedal pulses could not be felt but capillary circulation and skin warmth appeared to be adequate.

Initially treatment consisted of exercises, the application of ice packs, and elevation of the lower extremities. The extremity was subsequently wrapped in elastic bandages and was placed in balanced suspension. A sympathetic block was performed that reduced the edema but caused no appreciable change in arterial blood supply. Then anesthesia and paralysis of the distal part of the leg and foot developed overnight and the leg became ischemic below the knee.

Exploration of the left groin revealed a large organizing hematoma surrounding softer, more friable clots extending distally from the site of

femoral arteriogram. The needle tract of the previous arteriogram through an arteriosclerotic plaque could be visualized but it was obliterated and did not ooze at the time of exposure. A knee disarticulation was performed and the stump healed satisfactorily.

Case 4. A twenty-two-year-old man was admitted to the hospital after an automobile accident in May 1961, in shock with an open comminuted fracture of the left mid-femur, open fractures of the right tibia and fibula, and cerebral concussion. The wounds were debrided and closed with wire sutures. The left lower extremity was placed in balanced skeletal traction and the right lower extremity was placed in a long cast. The circulation of the right foot was extremely compromised and after twenty-four hours a right below-the-knee amputation was performed.

Forty-eight hours after injury, the patient was transferred to a general hospital; he was noted to be conscious but again in shock with no pulses in the left foot. After treatment of his shock and an epidural block, the left foot was warmer and the posterior tibial pulse was palpable. The block was continued for thirty-one hours. During the third day after injury acute renal failure occurred which necessitated placing the patient on an artificial kidney. Because of repeated cannulations, the patient received various combinations of antibiotics. The left foot and leg remained warm with good color; however, diffuse, brawny induration developed and increased in the thigh, associated with complaints of tenderness. Two weeks after injury, aspiration of the swollen thigh yielded 500 cubic centimeters of bloody fluid under moderate pressure. Within hours, the left foot and leg to mid-calf became cold and cyanotic. Until then the patient had been seen daily by the senior author and a vascular surgeon, and his pedal pulses ranged between weak and absent but the capillary circulation had remained adequate. In view of the acute vascular catastrophe and the patient's critical condition, amputation through the fracture site was thought advisable. This procedure revealed a layered hematoma and arterial bleeding from a tear in the superficial femoral artery at the fracture site. An above-the-knee amputation was performed. However, the patient died later due to renal failure.

Case 5. A twenty-eight-year-old man was hit by enemy mortar fire in October 1964, sustaining numerous soft-tissue wounds of the thorax and

extremities, a left radial palsy, open comminuted fractures of the left tibia and fibula, and an open right trimalleolar fracture. The wounds were debrided and the fractures were immobilized in plaster casts. There were no circulatory disturbances.

One month after injury, the patient complained of pain in the left thigh for the first time. The cast was changed. The thigh was noted to be slightly enlarged, indurated, and tender, but all wounds were healed. No bruit was heard and the peripheral pulses were palpable. The cast was reapplied.

Recurrent pain and swelling, localized in the left thigh, aroused suspicion of arterial laceration with slow leak which was confirmed by a femoral arteriogram made seven weeks after injury and three weeks after onset of symptoms. The arteriogram demonstrated a laceration of the artery, an extensive soft-tissue hematoma, and compression of the femoral artery. Exploration revealed a layered clot and a 0.5-centimeter laceration which was sutured. The patient made an uneventful recovery.

Physical Findings

These cases, seen during a twenty-three-year period, have many features in common, perhaps the most striking being failure to make the diagnosis and delay in treatment. The reason the diagnosis was so consistently missed was the absence of symptoms generally expected in an arterial injury. There was no disturbance of circulation distal to the lesion, since the pulses and capillary filling were normal, and there was no evidence of pulsation in the mass and no bruit.

The initial physical findings in each case were mild tenderness in the thigh and slight swelling. Fever developed in four of the five patients, leading to a faulty diagnosis of sepsis. An intermittent febrile course persisted even when multiple antibiotics were given. Pain increased in severity and was out of proportion to the gradual increase in swelling of the thigh, especially in Cases 1, 3, and 4 in which gangrene ensued.

Palpation of the swollen thigh revealed a local tumefaction, somewhat firmer and more circumscribed than an abscess, cellulitis, or the usual hematoma. There was no fluctuation or discoloration of the surrounding skin.

The Pathophysiology of Slow Arterial Leak

The terminal vascular occlusion is precipitated by an alteration of the homeostatic pressure balance existing between the enlarging hematoma and the resisting soft tissues.

Initially, there is a clinically benign period after injury to the artery. The circulation persists in a precarious state and there may be transient signs of vascular involvement initially, even though bleeding into the wound is not apparent. Through a mechanism of intermittent bleeding and self-sealing, the hematoma enlarges while the peripheral blood flow maintains the viability of the extremity. A sudden catastrophic climax occurs when the blood supply distal to the injury is interrupted as the result of one or more mechanisms.

In extremities with recent leaks, hemorrhage into an enclosed rigid compartment gradually compresses and occludes the artery. The expanding hematoma suddenly kinks and occludes the artery where it is fixed by surrounding tissues. Aspiration of the hematoma, as illustrated in Case 4, upsets the delicate balance between the pressure within the hematoma and intra-arterial pressure.

The arteriogram shown in Figure 1-B (omitted) illustrates the mechanism whereby the arterial lumen is compressed by the expanding clot and the femoral artery is kinked at the distal end of Hunter's canal where the vessel is fixed.

In leaks of longer duration, as organization and fibrosis of the clot at the site of injury progress, mild trauma may produce a tear of the organized hematoma that may extend into and enlarge the original defect in the artery, or a fresh hemorrhage may force the firm fragmented clot directly against the artery, thereby occluding it.

In Case 1, when the footrest of the patient's wheel chair came loose and acute flexion of the stiff knee occurred, this movement tore apart the intact clot.

In Case 2, a similar mechanism may have been involved.

In Case 4, aspiration of 500 cubic centimeters of blood presumably collapsed the wall of the hematoma composed of poorly organized clot and, when a surge of fresh hemorrhage occurred, the wall gave way and arterial occlusion was produced by the expanding hematoma.

In Cases 3 and 5, the counterpressure of the elastic bandage and plaster cast temporarily controlled the bleeding.

Diagnosis

The lack of the pathognomonic signs of injury to a major artery in these cases should be re-emphasized. Lumpkin and associates, reporting their findings by routine arteriography after acute trauma with possible arterial injuries, found two cases of arterial leak following knife wounds. In

both instances, there were no clinical indications to explore either wound except for its location near an artery. These patients might well have been treated on an ambulatory basis for asymptomatic knife wounds and serious complications would have developed in the ensuing weeks or months after the wounds had healed.

A slow arterial leak and a false aneurysm are variants of the same type of vascular injury. Review of the recent literature emphasizes the infrequent occurrence of these lesions. In most cases there is an enlarging, pulsatile mass, and a bruit develops, but occasionally the mass may simulate an abscess, as in our Case 1. These lesions have been reported after operations about the ankle, knee, and hip, and, as more cardiovascular surgery is done, they are being seen more commonly at the site of arterial cannulation and arterial graft replacement.

When a slow leak produces acute arterial occlusion, the decision to perform the mandatory exploration of the artery is easy and will reveal the arterial tear, whatever its etiology. When, however, the arterial occlusion develops during a twelve to twenty-four-hour period, the surgeon is prompted to temporize if he fails to recognize the underlying seriousness of the situation.

Fibrosis of muscle develops after eight hours of ischemia, while gangrene of the skin appears after twelve hours. The surgeon who awaits the tell-tale sign of early ischemic skin changes before he

makes a decision has permitted irreversible deep soft-tissue changes to develop, and only ablative surgery can then be performed.

Findings at Surgery

As soon as the deep fascia is split over the tumescence, a black, hard clot extrudes. This is followed by smaller, fresher clots which are softer and brighter red. Finally, brisk arterial bleeding is encountered from the site of the leak. The arterial wall is usually friable and both artery and vein are glued together by sheets of fibrin, necessitating sharp dissection whenever separation is required.

Summary

The final outcome in the cases reported here clearly emphasizes the importance of early diagnosis. In three of the five cases, amputation was required because the condition was not recognized in time. Pain and tumescence in a previously injured extremity and sometimes fever, mimicking sepsis, should alert the surgeon to the possibility of a slow arterial leak, even when the peripheral circulation is normal and there is no bruit or pathological pulsation. Arteriography should be performed whenever the diagnosis of slow arterial leak is considered.

(The omitted figures and references may be seen in the original article.)

ANEURYSMS OF THE AORTA: A REVIEW

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The natural history of a disease is always of interest to physicians. Once treatment is available this knowledge assumes practical importance because only by comparing results of therapy with the natural history of a disease is it possible to evaluate the effect of treatment. Evolution of the treatment of aneurysms of the aorta has been summarized by Mahorner and others. Excision of the aneurysm and suture of the wall of the aorta or replacement with a prosthesis has been accepted

treatment sufficiently long for the accumulation of meaningful data. It is therefore pertinent to record the prognosis of patients with untreated aneurysms so that comparisons may be made with those who have been operated upon.

In 1924 Boyd reviewed 4,000 cases of aneurysms of the ascending aorta. Approximately 52 percent died as a direct result of rupture of the aneurysm. Kampmeier studied 633 saccular aneurysms of the thoracic aorta and listed other

published series. Rupture of the aneurysm caused death in 39 percent of the patients. Estes reviewed the records and followed 102 patients with aneurysms of the abdominal aorta. Over an 8-year period the survival rate was 10 percent compared to 65.1 percent for the normal population at 65 years of age. Of 49 patients in whom the eventual cause of death could be ascertained 63.3 percent had died of rupture of the aneurysm. Cranley *et al.* reviewed 17,168 autopsies and found a total of 346 aneurysms of the aorta. After excluding dissecting aneurysms they analyzed 243 cases. Aneurysms caused death in 46 percent and were contributory to death in another 16 percent. In a selected group of patients Schatz *et al.* found that small aneurysms of the abdominal aorta had a less dire prognosis. Shennan apparently was the first to give an exact account of the way in which dissecting aneurysms developed. In 1843 Peacock described dissecting aneurysms and added five new instances to fourteen collected from the literature. Many reports attest to the high mortality rate associated with dissecting aneurysms. De Bakey, Cooley and Creech briefly reviewed the interim history and reported six patients whom they had treated by operation, four successfully. Other reports followed and in 1965 De Bakey *et al.* reported on the surgical management of 179 patients with dissecting aneurysms.

Methods and Materials

Data for the study of the natural history of aneurysms of the aorta were obtained from records of autopsies performed at Jackson Memorial Hospital during the 20 years from 1935 through 1954. Records prior to 1935 are unavailable. Since 1954 most patients with aneurysms have been operated upon. The aneurysms have been classified by site as ascending, arch, descending, thoraco-abdominal, abdominal, iliac and dissecting. Many aneurysms bridged two sites and in such instances the aneurysm was recorded as being in the more involved segment. Those in the descending aorta were distal to the left subclavian artery and proximal to the diaphragm. All abdominal aneurysms were distal to the renal arteries. When there was more than one aneurysm in a patient they were noted as separate and distinct. Attempts to subclassify aneurysms by etiology were abandoned because whereas some were unquestionably due to syphilis and others to arteriosclerosis the etiology of a large number could not be determined accurately.

Results

In 7,642 autopsy records reviewed, there were 192 subjects with a total of 249 aneurysms of the aorta or its major branches, an overall incidence in relation to autopsies of 3.2 percent. Of the total number of autopsies 1,495 or 19.5 percent were on subjects 25 years of age or younger in which no aneurysms were found. In another 646 autopsies ages of the subjects were unknown and only three aneurysms were discovered. If only those autopsies of subjects known to be over 25 years of age are considered the incidence of aneurysms in relation to autopsies was 4.5 percent. The incidence was highest among Caucasian men, followed closely by Negro men except for aneurysms of the ascending aorta when the occurrence was reversed. The greatest number of aneurysms were located in the abdominal aorta where there were 77, followed by ascending aorta with 55 (Table 1).

Fifty-five (22 percent) of aneurysms were in the ascending aorta. Treatment by wiring was attempted in one, leaving 54 for analysis (Table 1). Rupture caused death in 10 (18.5 percent) of the patients (Table 2). The greater the size of the aneurysm the greater was the possibility of death by rupture. Aneurysms 5 cm. or less in diameter were ruptured in only 2.3 percent of patients. Aneurysms greater than 5 cm. in diameter but not larger than 10 cm. were ruptured in 11.5 percent of patients. Four of nine aneurysms with a diameter greater than 10 cm. were ruptured. In addi-

TABLE 1. *Aneurysms by Site*

	Total		Treated	For Analysis	
	No.	%		No.	%
Ascending	55	22.1	1	54	23.0
Arch	29	11.6	1	28	11.9
Descending	19	7.6	0	19	8.1
Thoraco-abdominal	7	2.8	2	5	2.1
Abdominal	77	30.9	3	74	31.5
Iliac	12	4.8	0	12	5.1
Dissecting	43	17.3	0	43	18.2
Miscellaneous					
Aorta	2	.8			
Innominate	1	.4			
Hypogastric	1	.4			
Ductus arteriosus	1	.4			
False	2	.8			
Totals	249		7	235	

TABLE 2. *Cause of Death*

	Ascending Aorta		Arch of Aorta		Descending Aorta		Abdominal Aorta	
	No.	%	No.	%	No.	%	No.	%
Ruptured	10	18.5	9	32.1	3	16.7	21	28.4
Cardiovascular disease	22	40.7	7	25.0	9	50.0	25	33.8
Gastrointestinal disease	7	13.0	1	3.6	2	11.1	8	10.8
Respiratory disease	6	11.1	7	25.0			7	9.5
Neoplasm	3	5.6	1	3.6	3	16.7	7	9.5
Trauma	4	7.4					2	2.7
Second aneurysm	2	3.7	1	3.6	1	5.6	2	2.7
Occlusion carotid artery			2	7.1				
Aneurysm clotted							1	1.4
Unknown							1	1.4
Total	54		28		18		74	

TABLE 3. *Aneurysms of Ascending Aorta Causing and/or Contributing to Death*

	Caused Death by Rupture		Contributed to Death		Caused and Con- tributed to Death	
	No.	%	No.	%	No.	%
< 5 cm. diameter	1/44	2.3	0/44		1/44	2.3
5-10 cm. diameter	3/26	11.5	7/26	26.9	10/26	38.5
> 10 cm. diameter	4/9	44.4	0/9		4/9	44.4
Size unknown	2/10	20.0	0/10		2/10	20.0
Total	10/54	18.5	7/54	12.9	17/54	31.4

tion to 10 aneurysms that caused death directly, seven medium-sized aneurysms contributed to death (Table 3). In three subjects who died of cardiovascular disease, two had dilatation of the aortic ring due to the aneurysms and in one the aneurysm pressed on the arch of the aorta and occluded the common carotid artery. Six patients died primarily of respiratory disease but in four pressure on surrounding structures by the aneurysm may have contributed to death. Pressure caused tracheal compression twice, recurrent nerve paralysis once and partial occlusion of the pulmonary artery once. If aneurysms both causing and contributing to death are combined the rate was 31.4 percent. Six patients had two aneurysms. In three the second aneurysm was in the abdominal aorta and in three there was one each in the arch, the descending and the thoraco-abdominal aorta. Two of the second aneurysms, one in the descending and the

other in the thoraco-abdominal aorta, ruptured and caused death. The most frequent cause of death was cardiovascular disease and if two deaths from rupture of a second aneurysm are added, this group accounts for 44.4 percent of the deaths.

The arch of the aorta was the site of 29 aneurysms, 11.6 percent of the total. An unsuccessful attempt to wire the aneurysm in one patient leaves 28 for review (Table 1). At this site rupture was the cause of death in 32.1 percent (Table 2). Aneurysms larger than 10 cm. in diameter were ruptured in 44.4 percent of instances. Medium-sized aneurysms were ruptured in 16.7 percent. In these categories the number of aneurysms are few (Table 4). In nine subjects the aneurysm contributed to death. In seven there was pressure on surrounding structures, usually the trachea. In two involvement of a carotid artery resulted in occlusion and thrombosis. Of 28 aneurysms in this

TABLE 4. *Aneurysm of Arch of Aorta Causing and/or Contributing to Death*

	Caused Death by Rupture		Contributed to Death		Caused and Con- tributed to Death	
	No.	%	No.	%	No.	%
< 5 cm. diameter	0/24		2/24	8.3*	2/24	8.3
5-10 cm. diameter	3/18	16.7	2/18	11.1	5/18	27.8
> 10 cm. diameter	4/9	44.4	4/9	44.4	8/9	88.8
Size unknown	2/4	50.0	1/4	25.0	3/4	75.0
Total	9/28	32.1	9/28	32.1	18/28	64.3

* Occlusion of carotid artery.

segment of the aorta 64.3 percent caused or contributed to death. In six patients there were two aneurysms, the second located in the abdominal aorta in three and in the ascending in one, in the descending aorta in one and hypogastric artery in one. In three of six patients neither aneurysm caused or contributed to death. In one the aneurysm of the aortic arch was ruptured and in another rupture of the hypogastric aneurysm resulted in death. In the patient in whom the second aneurysm was in the ascending aorta there was tracheal compression.

Eighteen patients had a total of 19 aneurysms in the descending aorta. In the one with two aneurysms in this location both were small and neither caused death. No attempt was made to treat any of the aneurysms in this location. One half of the deaths resulted from cardiovascular disease but in three aneurysms were ruptured and caused death (Tables 1, 2, 5). None of the other aneurysms contributed to death. In seven of the eighteen there were two aneurysms. The second aneurysm was in the abdominal aorta in four, the ascending aorta in two and in the iliac artery in one. In none of the seven did the second aneur-

TABLE 5. *Aneurysms of Descending Aorta causing Death by Rupture*

	No.	%
< 5 cm. diameter	0/16	0
5-10 cm. diameter	2/8	25.0
> 10 cm. diameter	1/3	33.3
Size unknown	0/3	0
Total	3/19	15.8

TABLE 6. *Aneurysms of Abdominal Aorta Causing Death by Rupture*

	No.	%
< 5 cm. diameter	1/54	1.9*
5-10 cm. diameter	7/28	25.0
> 10 cm. diameter	7/10	70.0
Size unknown	6/20	30.0
Total	21/74	28.4

* A second small aneurysm clotted and caused death.

ysm cause death. However, one of the three ruptured aneurysms of the descending aorta was in this group. In three patients there were three aneurysms. The second was always in the abdominal aorta and the third was in the ascending aorta in two, and in the iliac artery in one. Of these nine aneurysms only the one in the iliac artery was ruptured.

There were only seven aneurysms of the thoraco-abdominal segment of the aorta and treatment was attempted in two leaving five for review. In four the aneurysm was ruptured and in the fifth the superior mesenteric artery was occluded with gangrene of bowel. One of the five had a second aneurysm of the ascending aorta.

Seventy-seven aneurysms of the abdominal aorta accounted for 30.9 percent of the total (Table 1). In three treatment was unsuccessfully attempted, twice by wiring and once by resection. Of the 74 remaining, approximately one third of deaths resulted from cardiovascular disease and almost one third from rupture of the aneurysm (Table 2). Two of 26 small aneurysms caused death, one by rupture and one by acute occlusion.

In no instance did aneurysms not causing death contribute to death. As expected the incidence of rupture increased with increasing size of the aneurysms (Table 6). In fifteen instances there was one aneurysm in addition to that of the abdominal aorta. In five the second aneurysm was of the descending aorta, in four of the iliac artery and in three each of the ascending and arch of the aorta. In 10 of the 15 neither aneurysm caused or contributed to death. Of the remaining five two deaths resulted from rupture of the aneurysm of the abdominal aorta and one each from rupture of the ascending, descending and arch of the aorta. In three instances there were two additional aneurysms; descending and iliac, ascending and descending, and descending and descending. In one patient none of the aneurysms caused or contributed to death. In the second the abdominal aneurysm was ruptured and in the third death resulted from rupture of the aneurysm of the iliac artery.

There were twelve aneurysms of the iliac artery in 10 subjects. Only one, an aneurysm less than 6 cm. in diameter, was ruptured. In this instance there were two additional aneurysms, one of the descending and one of the abdominal aorta. In addition to those with bilateral iliac artery aneurysms, four had second aneurysms of the abdominal aorta, three of which were ruptured. Cardiovascular disease caused five deaths and neoplasm one.

There were forty-three dissecting aneurysms in 43 autopsied subjects. In three the cause of death was unknown. In six additional cases the dissecting aneurysms did not cause death. In one the dissection was extensive, old, and healed. In the other five the dissections were small. Death in these six was caused by unrelated cardiovascular disease in three, by aortic insufficiency in one, by neoplasm in one and by miliary tuberculosis in

one. In three instances vascular occlusion resulting from the dissection was the primary cause of death. The vessels occluded were the left carotid artery, the inferior mesenteric artery and both femoral arteries. Thirty-one or 72.1 percent of deaths were a direct result of rupture of the aneurysm (Table 7). Approximately one-fourth of these patients were dead on arrival at the hospital and another one-fourth lived less than 24 hours after admission. Almost one-half, 45.1 percent lived longer than 24 hours. The site of rupture was pericardium in 16, descending aorta in seven, ascending and abdominal aorta in three each and the iliac artery in one. In one patient the site of rupture was unrecorded.

Discussion

The distribution and incidence of aneurysms in the aorta varies with reported series. Cranley *et al.* found the overall occurrence ranged between 0.7 percent and 3.3 percent. Another series lists an even wider range. The incidence varies depending on the years during which the series was collected, the population and the institution from which the series comes amongst other factors.

Aneurysms of the ascending aorta were found in 0.7 percent of all autopsies but constituted 22.1 percent of all aneurysms, and were the second most common type. Of the 54 aneurysms, 31.4 percent caused or contributed to death (Table 3). This data indicates that if all aneurysms of the ascending aorta were repaired surgically death from operation should be less than that figure. It would be improper to operate on small aneurysms if operative mortality were greater than 2.3 percent. Aneurysms larger than 5 cm. in diameter cause death more frequently and a higher operative death rate is justifiable. Cooley and De Bakey believe that resection of the ascending aorta for fusiform aneurysm is often the treatment of choice.

TABLE 7. *Dissecting Aneurysms*

	Ruptured		Vascular Occlusion		Death, Cause Unknown		Not Causing Death		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
DOA	7/31	22.6	1/3	33.3	0/3		0/6		8/43	18.6
Died < 24 hrs.	8/31	25.8	0/3		1/3	33.3	0/6		9/43	20.9
Died > 24 hrs.	14/31	45.2	1/3	33.3	2/3	66.7	5/6	83.3	22/43	51.2
Unknown	2/31	6.5	1/3	33.3	0/3		1/6	16.7	4/43	9.3
Total	31/43	72.1	3/43	7.0	3/43	7.0	6/43	14.0		

In saccular aneurysms a lesser operation may be satisfactory.

Aneurysms of the arch of the aorta caused or contributed to death in 64.3 percent of patients. This high death rate associated with medium-sized and large aneurysms makes treatment advisable. At this time excision of saccular aneurysms with aortic suture and excision and replacement with a prosthesis is accepted therapy.

The small number of aneurysms in the descending aorta in this series prevents definite conclusions but the lesions seem to be different from those more proximal. Rupture occurred less frequently.

There were only five aneurysms of the thoraco-abdominal aorta and all resulted in death. The low incidence of aneurysms in this site makes the reported series by De Bakey *et al.* remarkable. They operated upon 42 patients with an acceptable mortality rate of 26 percent.

No aneurysms of the abdominal aorta contributed to death but in 28.4 percent death was due to rupture. However, small aneurysms caused death by rupture in only 1.9 percent. Experience in treating aneurysms is greatest in this segment. In Hardin's 109 elective resections 8 percent of the patients died following operation. De Bakey *et al.* treated 1,719 patients, with an operative mortality rate of 8 percent. For the final two years of their study the mortality rate was 5 percent. Other reports confirm that resection of all but small aneurysms of the abdominal aorta is sound.

Markowitz and Norman reviewed aneurysms of the iliac arteries. Of 30 reported five had ruptured. Of 12 patients operated upon five died. Death occurred in two of three ruptured aneurysms in one that was wired and in one that was wired and wrapped.

In 179 operations for dissecting aneurysms De Bakey and associates reported an overall mortality rate of 21 percent and a remarkable rate of 12 percent for the last four years of experience. Wheat *et al.* have not been as successful and suggest a nonoperative method of treating selected patients with dissecting aneurysms. Of 43 patients 34 (79 percent) died as a result of the dissecting aneurysms. It seems that any treatment resulting in greater salvage would be acceptable.

However, eight patients of the 34 were dead at the time of hospital admission. Twenty-three patients alive at the time of admission might have been treated but subsequently died of their aneurysms. If only 23 of 43 patients were candidates for treatment the mortality rate following treatment should have been less than 53.4 percent. Eight of the 23 patients died within 24 hours of admission, six lived 3 hours or less, one lived 4 hours and the other 12 hours. If only those who lived longer than 24 hours are considered, 15 of 43 (34.8 percent) died as a result of their aneurysms. It is therefore clear that operative treatment is worthwhile.

Summary

Records of 7,642 autopsies were reviewed. In one hundred and ninety-two subjects there were a total of 249 aneurysms of the aorta or its branches, an overall incidence of 3.2 percent. If patients under 25 years of age and those whose ages were unknown are omitted the incidence of aneurysms in relation to autopsies was 4.5 percent.

Eighteen and one-half percent of 54 aneurysms of the ascending aorta were ruptured. In another 12.9 percent the aneurysms contributed to death. Small aneurysms were less likely to result in death than those over 5 cm. in diameter.

The arch of the aorta was the site of 28 aneurysms, of which 32.1 percent were ruptured but an additional 32.1 percent contributed to death.

In 19 aneurysms of the descending aorta only three (15.8 percent) were ruptured.

The abdominal aorta was the site of the greatest number of aneurysms, 74, the existence of which did not contribute to death but 28.4 percent ruptured and caused death. The larger the aneurysm the greater was the chance of rupture.

There were 43 dissecting aneurysms. Thirty-one or 72.1 percent were ruptured and three (7 percent) caused major vascular occlusions and death. In three instances the cause of death was unknown and six deaths were due to unrelated causes.

(The omitted references may be seen in the original article.)

MEDICAL ABSTRACTS

CORONARY DISEASE—45 YEARS AGO AND NOW

Arthur M. Masters MD and Leslie A. Kuhn MD,
Clin Pharmacol Ther 8(4): 603-614, July-Aug
1967.

That coronary thrombosis was in the past, and is now, perhaps our most important and serious disease is unquestioned. Improved diagnostic techniques, better clinical acumen, with resultant earlier recognition of the attack, more complete understanding of the disease by both physicians and the laity, and a more rational treatment have all helped to improve the outlook. Continued research can be expected to improve still further the immediate and long-term prognosis of patients with coronary thrombosis. The remarkable accomplishments in biochemical research and imaginative operations support optimism for the future. The ultimate and probably reasonable hope is that arteriosclerosis, which is a disease entity and not an "inevitable result of aging," may be effectively prevented, and that angina pectoris, subendocardial ischemia or infarction (coronary insufficiency), and acute myocardial infarction (coronary thrombosis) will become rare clinical experiences.

ATOPIC DERMATITIS (NEURODERMATITIS)

Lawrence M. Solomon MD and Herman Beerman
MD, *Amer J Med Sci* 478-496, Oct 1966.

In summarizing this article, the authors state that they have attempted to collate some of the recent literature in atopic dermatitis and have also tried to approach the subject from the various disciplines which have contributed to the recent advances made in the field. Further it seems probable that atopic dermatitis a hereditary syndrome whose cutaneous manifestations appear when the individual is under a stressful situation. The exact biochemical deficiency remains to be elucidated although strides are being made in that direction.

DUODENAL ULCER TODAY

UCLA Interdepartmental Conference—Moderated
by Martin A. Pops MD, Department of Medicine,
UCLA School of Medicine, Los Angeles, Calif. *Ann
Intern Med* 67(1): 164-182, July 1967.

The Moderator states that there are adequate physiological and therapeutic reasons for dividing peptic ulcer disease into anatomic compartments, that is peptic gastric ulcer and duodenal ulcer. As a group, patients with the more common duodenal ulcer tend to secrete more hydrochloric acid from the stomach when the gastric fundus has been stimulated. Duodenal ulcer patients tend to respond more readily to medical management or to no management at all. Differentiation from cancer is not, of course, a problem in duodenal ulcer. The topic of this conference was selected to clarify some of these differences and to discuss various aspects of the duodenal ulcer problem as it currently exists. The tremendous variability in management of duodenal ulcer around the world justifies a discussion of this problem, just as it points out our ignorance of the etiology, pathophysiology, and proper management of patients with this disease.

THE LYMPHOCYTE

Leo R. Zacharski MD, Richard W. Hill MD, and
Jorge E. Maldonado MD, *Mayo Clin Proc* 42(7):
431-451, July 1967.

Recently acquired data relating lymphocyte morphology and physiology with disease have been reviewed by the authors. Evidence for the existence of developmental and functional hierarchies within the lymphoid system is presented, but the significance in human disease is not defined. The importance of the lymphocyte in both circulating and cell-bound immune phenomena is elucidated. Other physiologic data relating to the lymphocyte life-span, recirculation, motility, and possible DNA donation and supportive functions are reviewed.

DENTAL SECTION

EFFECT OF ULTRASONIC INSTRUMENTATION ON HUMAN GINGIVAL CONNECTIVE TISSUE

J. Frisch, S. N. Bhaskar, and D. D. Shell, J Periodont 5(3): 123-125, May-June 1965.

Several articles have appeared in the literature with reference to the use of ultrasonic instrumentation and its effect upon the soft tissues of the periodontium. This article begins with a review of the literature related to ultrasonics and its use in scaling and curettage procedures. The purpose of the present study was to determine the merit and safety of the use of ultrasonics in gingival surgical procedures. The study was based on 75 cases in which one quadrant was used as a control and another quadrant was subjected to treatment with the ultrasonic instrument. The working tip was placed directly on connective tissue after removal of the overlying epithelium in the pocket area and also on the cut gingiva. The excised gingival tis-

sue that was exposed to ultrasonic treatment was studied microscopically.

The areas of surgery were evaluated clinically and a comparison of the control and experimental sides revealed no difference in the rate of healing. The microscopic studies revealed no detectable differences between the control and experimental sides. The lack or absence of morphologic microscopic changes found in this study vary with that of a previous study.

The authors conclude that it can be safely assumed that the ultrasonic instrument is not deleterious to the soft oral tissues and that it has considerable merit in periodontal surgery. Some of the advantages are:

1. Flushes the operative field
2. Better visibility
3. Removes calculus
4. Smooths root surface
5. Does not retard or impede healing

(Abstracted by: CAPT P. C. Alexander DC USN.)

PERSONNEL AND PROFESSIONAL NOTES

ADMIRALS EXCHANGE DUTIES

For the first time in the history of the U.S. Naval Dental Corps, one dental flag officer was relieved of his command by another dental flag officer.

RADM Eric G. F. Pollard, DC USN, was relieved as Commanding Officer, Naval Dental Clinic, Norfolk, Virginia, by RADM Maurice E. Simpson, DC USN, at 10:00 a.m., Friday, 28 July 1967.

Principal speakers at the ceremony were ADM Ephraim P. Holmes, Commander in Chief, U.S. Atlantic Fleet and RADM Reynold D. Hogle, Commandant of the Fifth Naval District.

Admiral Pollard will leave Norfolk after six and one-half years to become Director of Dental Activities for the Eleventh Naval District in San Diego, California. This position was previously held by Rear Admiral Simpson.

In addition to commanding the Dental Clinic, Rear Admiral Simpson will assume the responsi-

bilities of Assistant Chief of Staff for Dentistry and Fleet Dental Officer on the staff of the Commander in Chief, U.S. Atlantic Fleet, as well as Director of Dental Activities for the Fifth Naval District.

The two admirals represent half of the U.S. Navy's flag ranked dentists on active duty.

DENTAL TRAINING COMMITTEE

Manual of the Medical Department, Chapter 6-130 (2) states that the Dental Training Committee considers applications for advanced training when it meets early in January of each year. It is policy that the Committee will continue to meet at that period to act upon routine applications for training during the succeeding fiscal year.

A new requirement has developed that the Training Committee meet at additional times during the year to consider matters of an urgent rather than of a routine nature. During unscheduled meetings, the Committee will address its attention to determinations of policy and will act upon applications for training that are on file and considered to be in

the best interest of the Naval Dental Corps for action at that time.

A page change in Manual of the Medical Department is being prepared to reflect the above modification.

DENTAL CORPS STATISTICS

In the last issue of the *U.S. Navy Medical News Letter*, there appeared an article which set forth statistics relating to the practice of endodontics in the Naval Dental Corps.

The article was the first of a series that will be published as a matter of interest to members of the Dental Corps. The purpose of the series is to provide information that will serve as a factual source in the determination of trends in dentistry as practiced in the Navy. When possible, an effort will be made to interpret the statistics as they relate to naval dental practice.

The following is the second article in the series. (Editor's Note)

Trend in Crown Construction By RADM Frank M. Kyes DC USN

The construction of one classification of crowns has risen Navy wide from 367 in the last quarter of 1961 to 2,389 in the first quarter of 1967. Less spectacular but still very impressive is a 73% increase in total crown construction in the past five years.

This may be interpreted to mean three things. (1) Fewer badly broken down teeth are being uneconomically and repeatedly restored with silicate and plastics. (2) Fewer bridges need to be constructed. (3) Fewer destructive and undesirable so-called "flippers" or tissue bearing horse-shoe shaped partial dentures are being fabricated.

A change such as this is a tribute to the Dental Corps' increasing attention to preventive measures and pulp and tooth conservation. The patient is the chief beneficiary of this marked improvement. However, through interface benefits, the Naval Dental Corps' future workload is lessened with present conservative procedures.

Each dental officer in each operating room can well be proud of this record.

CONTINUING EDUCATION COURSES FOR DENTAL OFFICERS USNR-R

The following courses and convening dates will be available to Reserve Officers 2205, USNR-R,

for active duty for training during fiscal year 1968 at the Naval Dental School, National Naval Medical Center, Bethesda, Maryland.

This training will be taken with officers on active duty and consists of short postgraduate courses on the military aspects of various dental subjects. The courses offered are of *two weeks duration* with pay and are as follows:

Preventive Dentistry	11-15 Sept 1967
Occlusion	18-22 Sept 1967
Complete Dentures	25-29 Sept 1967
Fixed Partial Dentures	2-6 Oct 1967
Operative Dentistry	27 Nov-1 Dec 1967
Endodontics	4-8 Dec 1967
Oral Pathology	8-12 Jan 1968
Oral Surgery	15-19 Jan 1968
Oral Roentgenology	22-26 Jan 1968
Periodontics	22-26 Apr 1968
Removable Partial Dentures	29 Apr-3 May 1968

NOTE: In course that runs from 8 Jan-26 Jan 1968, the officer may have his choice of either Oral Pathology and Oral Surgery, or Oral Surgery and Oral Roentgenology.

Quota Control: Assigned for each course:

COMONE	: 1	COMSIX	: 1
COMTHREE	: 1	COMNINE	: 3
COMFOUR	: 2	CNARESTRA	: 1
COMFIVE	: 1		

CONTINUING EDUCATION COURSES CONDUCTED BY U.S. ARMY

Attention is invited to a listing in the 11 August issue of the *U.S. Navy Medical News Letter* of Postgraduate Professional Short Courses to be conducted by the U.S. Army during Fiscal Year 1967.

Officers of the Regular Naval Dental Corps may make application in the same manner as for short courses at the Naval Dental School, MANMED art. 6-130. Budgetary limitations usually preclude travel and per diem support.

Officers of the Naval Reserve may make application in accordance with current directives through District Commandants.

NURSE CORPS SECTION

CORPUS CHRISTI'S INTENSIVE CARE UNIT

The Nurse Corps Officers at the Naval Hospital, Corpus Christi, Texas, recently presented their Inservice Education Program "Nursing Care in an Intensive Care Unit" and held it in the hospital's ICU. Presenting the program was LCDR Billie Edwina Cordell, NC USN, Charge Nurse of the Unit. Resource speaker on one phase of the unit was LT Alfred Iacobucci, MC USNR, a member of the Internal Medicine Department of the hospital.

Giving the history and background of the unit (third such unit in a Stateside Naval Hospital), LCDR Cordell stated the unit opened 1 July 1958 as a Recovery Ward. In 1959, under the leadership of the then Commanding Officer, CAPT L. G. Bell, MC USN, it was expanded into an Intensive Care Unit. Its purpose is to concentrate skilled nursing care of critical and acutely ill medical and surgical patients.

Corpus Christi's Intensive Care Unit differs from other patient areas of the hospital in several ways. Using a mock unit setup as a demonstration, LCDR Cordell explained what makes up this ICU. This area is a compact unit with individual compartments assuring the patient privacy. Each bed position is equipped with wall suction and oxygen outlets, wall sphygmomanometers, mobile oral suction machine, mobile bedside locker, IV tray, stethoscope, clip board with plotting sheets and intake and output sheets. Positioning of equipment and contents of bedside locker is identical in each patient area. This facilitates location of needed articles in any emergency. One section of the unit is used as a Recovery Ward for postoperative patients until discharged by the Anesthesiology Service. Three single bed quiet rooms are used for seriously ill infectious cases (*pseudomonas*). One area of the unit can be converted to receive mass casualties such as those received from aircraft accidents. The bed capacity is fifteen adult beds and six pediatric cribs.

Developed in the unit and proving their worth are the Crash Cart and IV tray. Built by Public Works from an unused dressing cart, the Crash Cart is complete with life saving equipment—automatic

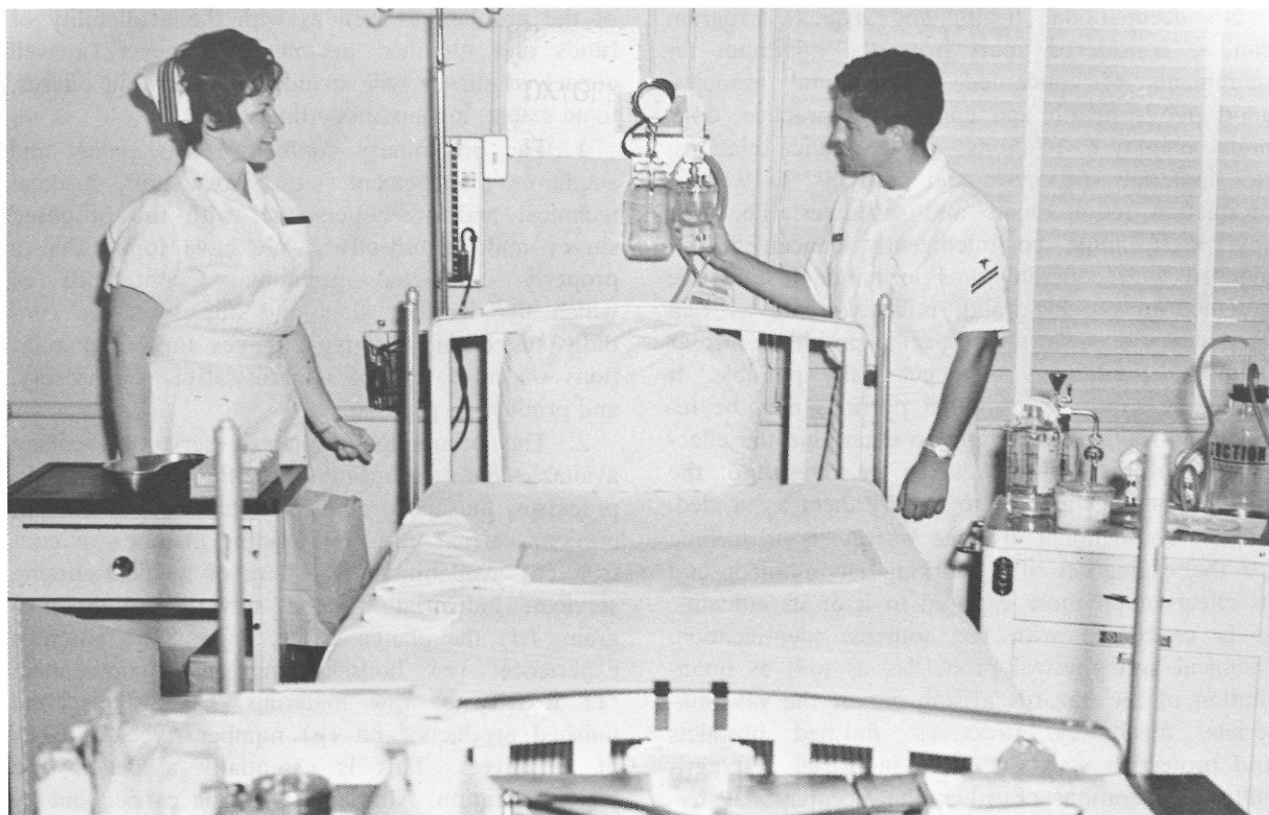
rotating tourniquet, AMBU, medications, intubation tubes, emergency surgical trays and Cardiac Monitor with Pacemaker, Defibrillator. The Charge Nurse, working with Public Works, devised this very workable IV tray. Made of stainless steel, it consists of one large section for IV injection sets (adult and pediatric) and blood recipient sets and small individual sections for various sizes of IV needles, intercaths, angiocaths, pediatric scalp vein, adhesive tape spindles, 4x4, etc.

Incorporated into the Nursing Procedure Manual (as on all wards) are ICU routines, written in outline form in simple, concise language. Assigned members of the AM crew check all wall suction and O₂ outlets, oral suction machines, Bird apparatuses, Crash Cart and IV trays daily. Bedside units are restacked as used. Weekly cultures are submitted on both refrigerators and ice machine. These reports are submitted to the officer in charge of ICU (Chief of Medicine).

Nursing care on the ICU is multivalved, and is seldom a solo performance. A Charge Nurse Assigned in this specialized area must be well versed in basic nursing skills, be an expert in giving medications and treatments and in observing patients for minute or gross responses, having a working knowledge of complicated or simple equipment, prevent infections, be able to delegate care of patients, and make use of all spare time and slack periods of activity to teach the ever-changing personnel.

Introducing Dr. Iacobucci as one of the faithful instructors to the unit, the program was turned over to him for a discussion of cardiac care.

Dr. Iacobucci gave a clear, concise review of the anatomy and physiology of cardiovascular system. He then went into a detailed explanation of electrocardiography. He strongly emphasized that nursing diagnoses and decisions are extremely important in cardiac patient care. He also stressed the nurses role in interpreting the patient's clinical signs and in reading cardiac monitors. Today's nurses and nurses of the near future must be able to determine the difference between pulmonary failure and cardiac failure. Success of cardiopul-



Intensive Care Unit, Patient Unit; LCDR Billie Edwina Cordell NC USN and Forrest R. O'Connor HN USN—
Official U.S. Navy Photograph.

monary resuscitation depends upon an alert nursing staff observant of patient's symptoms, knowledgeable in reading monitors, and skillful in resuscitation techniques.

A discussion and demonstration of CPR techniques followed. LT Iacobucci and LCDR Cordell then explained the Cardiac Cart and demonstrated the equipment—Cardiac Monitor, Pacemaker and Defibrillator.

Concluding, this charge nurse mentioned the periodic review by staff personnel of the ICU's specialized equipment. With the generous help of the Medical Staff this is accomplished, and it is believed to be one of the essentials in maintaining and developing nursing service performance.—Public Affairs Office, Naval Hospital, Corpus Christi, Texas.

OCCUPATIONAL MEDICINE SECTION

THE OCCUPATIONAL HYGIENE SURVEY: PRINCIPLES, PRACTICE, SIGNIFICANCE

*Mark M. Luckens Ph.D, Lexington, Ky. Amer Industr Hyg J 28(2): 179-183,
Mar-Apr 1967.*

An occupational (industrial) hygiene program, to be effective, must be based on truly representative data and information gathered in the course of a well planned and executed survey. Such a survey cannot be a "one shot" affair. It must be continuous, flexible, integrated with process re-

quirements, and reflect management's policy to play a responsible role as a corporate citizen. It should consider the long-term (as well as short-term) impact of materials, processes, and effluents on personnel, the vicinity of the plant, and the community in which it operates.

No occupational health and hygiene program can be considered apart from the minimum requirements of concerned governmental agencies, good public health and engineering practice, optimum employee relations, good public relations, raw materials, processes and products, as well as production requirements and schedules. The survey, itself, must be intelligently conceived and planned with concrete aims in mind. It must be designed to provide valid, utilizable data as well as practicable answers to specific problems insofar as it is scientifically and technically possible. It should be so constructed that portions may be retained as routine procedures to determine the effectiveness of the measures taken as a result of the survey's findings and/or to modify them as needed.

The occupational hygiene survey is a technic for the evaluation of a working environment and its effects upon those exposed to it or its effluents. It is concerned with the sources, identification, chemical and physical properties as well as quantitation of the hazards arising out of the raw materials, machinery, processes, finished products and protective agents used in industrial and agricultural operations. Further the occupational hygiene survey is concerned with the evaluation and identification of the types of biologic damage and physiologic response arising out of such operations.

Since it is a method or technic, it is effective only to the extent that it is carried out by competent personnel with due regard for their obligation to avoid partiality, selfish interest, and prejudice.

The occupational hygiene survey is essentially a planned sampling and analytical program often combined with engineering, scientific, and medical procedures—designed to evaluate the vocational complex. The vocational complex or work situation may, for the purposes of clarity, be considered to consist of three interrelated components: (1) basic environmental component; (2) the machine-process component and; (3) the biologic component.

An occupational hygiene survey may be initiated in response to: (a) an actual or potential problem; (b) obtain data for legal or record purposes; (c) study the efficiency of existing controls; (d) obtain data for the design of controls; (e) investigate the probable effects of new products or proposed processes on the worker and/or the consumer; (f) need to evaluate an industry; or (g) for research purposes.

The actual extent and procedures of any given survey will vary with the dimensions and urgency

of the problem as well as with the availability of funds and qualified personnel. However, a well conceived survey will include the following phases, to an extent, in its main outline:

1. The preliminary conference sets policy and acquaints management, supervisory staff, medical technical and other personnel with the proposed survey and its objectives. We have found that a properly conducted preliminary conference in which the survey's aims and objectives are candidly stated and discussed makes for better relations on all levels of administrative, supervisory, and production personnel.

2. The occupational analysis serves to collect available data regarding: (a) the raw materials, processes, finished products, by-products of the operations carried out; (b) existing methods of control; (c) availability and extent of medical-nursing services, industrial hygiene services, safety program; (d) the plant's safety, illness, and absentee experience; (e) housekeeping and maintenance; (f) toxicity of raw materials, by-products, and finished products; and (g) number, type, and sex of employees. This is essentially a pencil and paper operation. Although it can be carried out by a technical or medical person not trained in industrial hygiene, it would not be wise to do so. It serves to acquaint the hygienist with the operation of the plant and its processes and to indicate the extent of actual and/or potential hazards.

3. The preliminary survey has as its purpose the location of those areas in the plant where hazards or exposures exist. It may be carried on concurrently with the occupational analysis. It should be conducted by a person well grounded in industrial hygiene (occupational hygiene). He should be familiar with the industry and have a knowledge of the chemistry of the products and processes involved. Accompanied by the superintendent or another person qualified to explain (in detail) the processes and steps in the production sequence, all processes and operations carried on in the plant are followed—from raw materials to finished product. The plant physician or nurse may be particularly helpful in pointing out departments which have been troublesome, medically. The safety engineer or supervisor should be consulted for the safety and accident record of each section under investigation. His cooperation in pointing out physical and operational hazards should be actively sought. Each work area (and station) is visited. Ventilation and cross drafts are checked with smoke tubes. All operations are observed in detail. House-

keeping and sanitary facilities are checked. Illumination, temperature, vibration, and excessive noise are noted. Odors, dusts, smokes, mists, vapors, and gases are noted, identified, and roughly quantitated organoleptically. Where odorless and colorless gases are suspected, field-type tests are made. The flow of raw materials, by-products, wastes, and finished products is followed, in sequence, and investigated from the view of good safety and industrial hygiene practice. Machinery and machine guards, as well as their biomechanical aspects, are checked. Without obviously (or primarily) examining the exposed portions of the worker's body, the hygienist is on the alert for occupational marks. He pays attention to the general appearance and mannerisms of the employee which may be referable to acute or chronic exposure. Unless the hygienist is also a physician, these observations should not be considered diagnostic. However, the observation of such signs are suggestive and should always be referred to the plant physician. The noting of such stigmata or mannerisms may make it possible to find evidence of exposures which might otherwise be missed.

This phase of the occupational hygiene survey is designed to yield information indicating: (a) the adequacy of existing health and safety practices; (b) the need for controls; (c) the attitude of management, supervisory, and technical staff, or other personnel towards health control measures; (d) the type of personnel employed, their training, skill, and adequacy for specific operations from an industrial hygiene point of view; (e) the areas and/or processes requiring sampling and analysis; and (f) the type of equipment and procedures required for the detailed occupational survey.

Depending upon the size and complexity of the plant, this portion of the survey may take anywhere from a day to a week or more. At this point, whether these three phases have been conducted sequentially or concurrently, a report should be made to management. Such a report should appraise management of the survey's findings and present detailed plans for the investigational survey to follow.

4. The detailed or investigative survey may take two weeks to several months. It is designed to: (a) evaluate the exposures in the plant; (b) evaluate the factors in the physical environment; (c) develop data for the design of control measures and/or equipment; (d) modify (and if necessary eliminate or change) processes or materials, where indicated; (e) set the necessary hygienic

standards for operations; and (f) provide for routine check-up of exposures. While not always combined with medical examinations, it is often advantageous to include such studies at this point. Some managements feel that a combined medical-investigative survey should follow the detailed survey. This is purely a policy decision. However, the advice of the industrial physician and the hygienist should be sought, since it could save time and money, to say nothing of preventing duplication. Following the plan devised as a result of the preliminary survey, the general as well as the "breathing zone" atmosphere is sampled in each work area (and operation, if indicated). Where contamination of skin or clothing is suspected, suitable procedures are utilized to determine the extent of such contamination. All exhaust and local ventilation is measured. All the factors noted previously (under preliminary survey) are checked and quantitated. The observations and sampling are conducted during each shift under normal as well as unfavorable conditions. A sufficient number of samples are taken under these circumstances, to ensure a representative picture of the exposure as well as to provide for analytical reproducibility and statistical treatment. When the exposure results in the presence of the contaminant or its metabolites in the blood and/or urine, these body fluids are sampled, analyzed, and correlated with concomitant exposure data. It is here, particularly, that the plant physician plays a most valuable role. Information from medical data, obtained concurrently with these sampling studies, may save the cost of repeating them during a special "combined medical-investigative survey."

It is most important that the supervisory personnel and others involved in the survey do not rouse the fears of the workmen concerned. Also, it is essential that the operations proceed "as usual." Good employee relations are essential during the survey, since curiosity and fear may precipitate ill-will and defeat the very purpose of the entire procedure. Some industries have found it advantageous to explain the purpose of the survey, candidly, to the employees involved. Knowledge that the study is being made for their benefit and that it will form the basis of a routine environmental surveillance usually results in cooperation and improved employee relations.

The chemical composition of all raw and finished materials, solutions, solvents, by-products, etc., are checked for chemical composition, handling, storage, and disposal. Food service, water supply,

waste disposal, locker and washroom facilities, plumbing, and cross connections are all checked. Often what appears to be an "industrial" hazard turns out to be the result of poor housekeeping or sanitation rather than the result of occupational exposure. Many a dermatitis has been traced to poor hygiene rather than to a process. Illumination, noise, vibration, temperature, humidity are quantitated as indicated. All machinery and guards as well as operational procedures are checked to see whether they comply with acceptable biomechanical principles.

After completion of the observations, measurements, sampling, and analyses, the resulting data are collated and evaluated. On the basis of the information obtained, recommendations for the control of specific situations are made. Such recommendations may well include: (a) design of new or improved local or general exhaust ventilation; (b) change in processes; (d) substitution of raw materials, solvents, etc.; (e) use of personal protective devices; and (f) institution of special procedures, etc.

5. The "combined medical-investigative survey" is an elaboration of the detailed investigative survey just discussed. It is undertaken to: (a) study the etiology of an industrial disability; (b) determine limits for exposure (e.g., threshold limits); (c) study the effects of new products and/or processes; (d) obtain data for medico-legal purposes; and (e) research.

The procedures are, essentially, the same as those previously outlined. However, they are done in greater depth and constantly correlated to concurrent medical studies of the workers involved.

6. Surveillance or routine sampling and analytical programs are undertaken to determine the effectiveness of the control measures instituted as a result of the recommendations of a survey. In addition, they provide continuous data regarding the exposure of the workers, or changes in the effluents from a given process.

Although the occupational survey is basically an applied science and engineering procedure, the role of the plant physician in the survey and its implementation should not be underestimated. By training, experience, and responsibility, he is concerned with the observation and evaluation of the physiologic response of the worker to a given set of conditions. By extension of epidemiologic principles, he may be able to relate extra-plant and/or extra-occupational exposures and stresses to the plant situation.

The industrial hygienist is concerned with the examination and evaluation of the physical and chemical components of a given environment and relating them to the physician's clinical observations. Whatever his basic scientific training or area of specialization, the hygienist is an epidemiologist concerned with the etiology of occupational disability. By examining, quantitating, and evaluating the physico-chemical stresses to which the worker is exposed under a given set of conditions (and when possible noting the employee's biochemical response), he provides the physician with information needed for diagnosis. At the same time he provides design data for amelioration of the occupational hazard.

The physician and the industrial hygienist serve as complementary members of a team essential for the control of occupational disability. This is effected by controlling the worker as well as the work environment. The worker is best controlled through: (a) pre-employment and routine periodic examinations; (b) rotation of workers; (c) supervision of nutrition, diet, and personal hygiene; and (d) a continuing program of education.

No matter the effectiveness or degree of control of the worker, it will not (of itself) prevent occupational illness. It must, of necessity, play a subsidiary role to the control of the environment. Given a sufficiently massive exposure, no amount of medical supervision or education and training will prevent illness. The hazard must be brought to a sufficiently low level that a modicum of medical surveillance and training will be sufficient to prevent occupational disability or poisoning. The existence of airborne toxicants or deleterious particulate matter, poor illumination, excessive noise and vibration, extremes of temperature and humidity, radiation hazards, poor machine design will be reflected in occupational disability, low production rates, inferior products and low morale, no matter the extensiveness of physical examinations, employee education programs, and fringe benefits. Although one cannot underestimate the importance of the medical phase of control, the application of the principles of toxicology as well as technical and engineering methods to the control of occupational disease and hazards cannot be overestimated.

Summary

The occupational (industrial) hygiene survey delineates the etiology of occupational disease. It

determines and measures the environmental hazards as well as the magnitude and variety of physiologic response associated with an occupation or industry. Correctly conceived and executed, it serves as a model and training ground for the co-

operation of personnel and the integration of engineering, scientific, and medical disciplines necessary for the conservation of industrial (occupational) health.

EDITOR'S SECTION

AN OPEN LETTER FROM VICE ADMIRAL R. B. BROWN, SURGEON GENERAL OF THE NAVY ON THE 125TH ANNIVERSARY OF THE FOUNDING OF THE NAVY MEDICAL DEPARTMENT

On this occasion of the 125th anniversary of the Navy Medical Department, I think it appropriate to pause and reflect on the course Navy Medicine has taken for the past century and a quarter, and look ahead at the years to come.

During the past 125 years, medicine has made tremendous advances, and the Navy Medical Department has kept pace. It has progressed from the rudimentary procedures of the 1840's to the highly sophisticated equipment and advanced techniques of today. And though this past has been exciting and challenging, the future holds no less excitement and an even greater challenge. As man goes forth to explore the worlds beneath the seas and beyond the planets, the responsibilities placed on the men and women of the Navy Medical Department will become even greater. I am confident that you will continue not only to meet, but to surpass, all that may be asked of you.



R. B. BROWN

AMERICAN COLLEGE OF SURGEONS MEET

The American College of Surgeons will hold its annual Clinical Congress in Chicago this coming October, and the Naval Hospital, Great Lakes will again host a cocktail party for Navy medical officers and their guests. The Navy Cocktail Party will be held on Wednesday, 4 October 1967 in the Upper Tower of the Conrad Hilton Hotel from 6:00 to 8:00 p.m. There will be a cash bar and a charge of \$2.50 per person for hors d'oeuvres. Reservations may be addressed to the Chief of Surgery, Naval Hospital, Great Lakes, Illinois, 60088 and are requested to be made prior to 15 September. Checks may be made payable to CAPT Philip O. Geib.—Naval Hospital, Great Lakes, Ill.

ANNUAL MEETING OF THE SOCIETY OF MILITARY ORTHOPEDIC SURGEONS

The Society of Military Orthopedic Surgeons will hold its annual meeting at the Fitzsimmons Army General Hospital, Denver, Colorado, 18–22 September 1967. The Bureau of Medicine and Surgery is tentatively arranging an airlift from Andrews AFB, Washington, D.C. to Denver and return to accommodate a limited number of medical officers desiring to attend. The aircraft will depart Andrews AFB at 1200, 17 September 1967 bound for Denver, and will depart Denver for return to Andrews AFB at 0800, 23 September 1967.

Reservations for seating on the aircraft may be requested by contacting in writing or by phone the Professional Division, Code 31, Bureau of Med-

icine and Surgery, Navy Department, Washington, D.C. 20390 (Telephone OX 6-1834). Scheduled dates are tentative and requests will be considered on a first come basis. Requests should be submitted as soon as possible.—Professional Div, BuMed.

ANNUAL MEETING OF THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS

The American Society of Anesthesiologists will hold its annual meeting at the Sahara Hotel, Highway 91, Las Vegas, Nevada, 28 September through 4 October 1967. In conjunction with this meeting the Navy Anesthesiologists will hold meetings to discuss related problems. The Bureau of Medicine

and Surgery is tentatively arranging an airlift from Andrews AFB, Washington, D.C. to Nellis AFB, Nevada to accommodate a limited number of medical officers desiring to attend. The aircraft will depart Andrews AFB at 1200, 27 September bound for Nellis AFB. It will depart Nellis AFB at 0800, 4 October for return to Andrews AFB.

Reservations for seating on the aircraft may be requested by contacting in writing or by phone the Professional Division, Code 31, Bureau of Medicine and Surgery, Navy Department, Washington, D.C. 20390 (Telephone OX 6-1834). Scheduled dates are tentative and requests will be considered on a first come basis. Requests should be submitted as soon as possible.—Professional Div, BuMed.

READY MEDICAL TREATMENT — THE PSYCHOLOGICAL FACTOR IN VIETNAM AMPHIBIOUS OPERATIONS

By Dave Colby JO2

Aboard the PRINCETON (LPH-5)—Doctor Ronald L. Bouterie was busy the day before Operation Beacon Hill began, but nowhere near as busy as he would be in the ensuing days of the amphibious assault.

The Navy lieutenant commander and the team of three other doctors and 20 corpsmen he heads would treat nearly 250 war wounded aboard the helicopter assault carrier Princeton in the following 13 days of Beacon Hill.

A few hours before the actual assault began four miles south of the Demilitarized Zone the team had finished supervising the construction of a 120-bed surgical hospital in the 21-year-old ship.

A Development of the 60's

Hospital ships are not a new concept, but complete medical treatment stations in combat ships such as the Princeton have developed in this war of the 60's.

The Princeton is the second Seventh Fleet assault helicopter carrier to have these facilities installed and Beacon Hill was the fourth operation in which the surgical team used these floating hospitals.

Dr. Bouterie, who is from New Orleans, and his team have been credited with much of the pioneer-

ing in this medical field. During the short time—less than a year—this concept has been used the dividends have been high.

Those Restored to Combat Are Many

Operation Deckhouse VI, which preceded Beacon Hill, had 211 friendly casualties. One hundred and forty of these were restored to combat status because of fast and complete medical attention close by in a combat ship.

Dr. Bouterie said that the average time it takes to get a man who is wounded to the operating table in Vietnam is about two hours.

However, with the floating hospital off-shore during an assault, and helicopter transportation available, the wounded can be receiving complete medical attention within 25 minutes.

In comparison, the Louisiana State graduate said, similar treatment took almost nine hours in World War II and a little over six hours in Korea.

"Med-Evac, Inbound"

He explained that in these previous wars the hospitals were moved ashore after a combat area was secured; in Vietnam the casualty is helicoptered to the hospital off-shore.

When a helicopter lands on the assault ship's flight deck the medical treatment begins simultaneously. The piping down of a "Med-evac, inbound" over the ship's public address system sets off a rapid chain of events. Stretcher bearers and corpsmen man stations along the medical evacuation route that represent intermediate treatment points before surgery.

On the Princeton the hospital is five decks below the main level, the patient is moved the distance by elevator. Along the way his clothes are stripped off, condition diagnosed, and wounds are recorded. If he is hemorrhaging this is stopped as soon as possible, fluids are administered, and a tetanus vaccine given. By the time he reaches the doors of the operating room he is ready for surgery.

A Marine, who rode a medical evacuation helicopter back to the Princeton uninjured, can testify to the swiftness of this process. "Before I knew what happened I was riding down an elevator, naked, with a corpsman sticking a needle in my arm. I had a hard time convincing them there was nothing wrong with me."

The Psychological Factor

Colonel Harry D. Wortman, who commands the Marine Special Landing Force, pointed out that such treatment has a great psychological bearing on the Leathernecks in the field. He said, "The fact that they know medical attention is close by makes all the difference in the world in their attitudes."

Dr. Bouterie expanded on this aspect. "A Marine sees his buddy get hit in the field. He worries about his friend, and he starts to wonder about himself. He asks, 'What happens if I get hit?' When he returns to the ship he usually finds his friend doing fine. Thus, his confidence is boosted."

Less than a year ago surgical teams were assigned to the Seventh Fleet Amphibious Force on a temporary basis. In August Dr. Bouterie's team became the first permanently assigned. The team

—the only one afloat in Vietnam—has three medical specialists. Dr. James Coleman of Long Beach, California is an orthopedist, Dr. William Higgins of Counsel Bluffs, Iowa is an anesthesiologist, and Dr. Bouterie specializes in general surgery.

During an amphibious assault long hours are spent in the operating room. Dr. Bouterie once operated for 36 straight hours and has often been called on to work from four to six hours at a stretch on one operation.

A Challenge

"It has been a challenge," the stocky father of seven said. "This team believes in what it is doing and everyone is doing a good job of it. Because we function as a team it's impossible to single out an individual for all the credit."

But in March the South Vietnamese singled out Dr. Bouterie for his contributions to their cause. He, along with nearly 300 other U.S. fighting men were selected to be honored by the Vietnamese government aboard the aircraft carrier Enterprise.

On March 29 the ceremony was held but Dr. Bouterie wasn't present. Instead he was in the Princeton's operating room working over a wounded Marine as Operation Beacon Hill ground on against the enemy just south of the DMZ.

Editor's Note: Dr. Bouterie was presented the Republic of Vietnam Navy Distinguished Service Order Second Class by VADM John J. Hyland, Commander Seventh Fleet, aboard the Princeton on May 25 in recognition of his service during two major amphibious assaults. The citation read in part: "Lieutenant Commander Bouterie efficiently organized the medical preparations for receiving combat casualties and used his outstanding surgical skill to save the lives of Vietnamese and U.S. personnel during the operations. His meritorious service and medical achievements greatly benefited the Republic of Vietnam by many men who could thus continue to fight for freedom."—Public Affairs Office, Amphibious Group Three, FPO San Francisco.

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